

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 200310120PFQ	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/IL 03/00865	International filing date (day/month/year) 23.10.2003	Priority date (day/month/year) 23.10.2003
International Patent Classification (IPC) or both national classification and IPC G03G15/10		
Applicant HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P. et al.		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 4 sheets.

- This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 29.09.2004	Date of completion of this report 02.02.2006
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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IL 03/00865

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-5, 7-9 as originally filed
6 filed with telefax on 20.10.2005

Claims, Numbers

1-18 filed with telefax on 19.01.2006

Drawings, Sheets

1/2, 2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-18
	No: Claims	-
Inventive step (IS)	Yes: Claims	1-18
	No: Claims	-
Industrial applicability (IA)	Yes: Claims	1-18
	No: Claims	-

2. Citations and explanations

see separate sheet

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Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: EP 0 935 173 A1	(11/08/1999)
D2: US 2002/0106 220 A1	(08/08/2002)
D3: US 4 974 027	(27/11/1990)
D4: US 2002/0176 723 A1	(28/11/2002)

2. The document D1 is regarded as being the closest prior art to the subject-matter of claims 1 (method of heating a toner image) and 14 (system for heating a toner image) and discloses ([0025]-[0043], fig.4,8-10,13-15,17): A method of and a system for heating toner of an image on a moving surface of an intermediate transfer member, comprising the provision of a toner image on the intermediate transfer member 15 ([0024], [0028]) at a first position and placing a surface of a heating member 18 in contact with said image prior to transferring the toner image to a further surface from the intermediate transfer member ([0026]-[0030]) at a second position.

The subject-matter of claims 1 and 14 differ from this known method and system in that the image on the intermediate transfer member is heated in addition by a heater internal to said intermediate transfer member.

The subject-matter of claims 1 and 14 is therefore new (Article 33(2) PCT):

2. The problem to be solved by the present invention may be regarded as to reduce the energy required for heating the toner image.

The solution to this problem proposed in claims 1 and 14 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Although both methods of heating an intermediate transfer member internally (D2, [0028]-[0043]; fig.1-5) and direct heating of the image on the member (discussion of D1 above) are known, there is no hint in any of the prior art documents D1-D4 to combine both heating methods, in particular in the light of applying less energy for heating the

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toner image. A method to better control the temperature of a bias transfer roller of an intermediate transfer member by application of both internal heating device 222B and an external heating device 221B is known from D4 [0071] and fig.8, but there is no hint to apply such a combined solution to heat the image on said transfer member.

3. Claims 2-13 and 15-18, respectively, are dependent on claims 1 and 14, respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VIII

Certain observation (clarity)

1. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
2. Independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1, D2 and D4 is not mentioned in the description, nor are these documents identified therein.
4. Claim 8 is dependent on claim 7.
5. It is not clear what the intention of the last sentence of the description is, as the meaning of "comprise" is anyway laid out for example in EPC GD-C-III 4.13.

ITM 20 is a drum (or a blanket on a drum) coated with materials suitable for receiving the toner from photoconductor drum 10 and transferring it to output medium 60, for example as described in US patents 4,974,027; 5,335,054; 5,276,429; 5,815,782; 5,410,392; 5,592,269; 5,745,829; 6,551,716; 6,584,297; and PCT publication WO 97/07433, the disclosures of which is incorporated herein by reference.

In an exemplary embodiment of the invention, a heating roller 80 is coupled to ITM 20, such that it will rotate with ITM 20 while forming direct contact, in order to directly heat the toner image on the surface of ITM 20. Optionally, heating roller 80 is made from a metal and coated with a substance that is durable to heat, smooth and non-adhesive, for example silicone, condensation cured silicone, Teflon, HTV and RTV fluorosilicone or other fluoromaterials; blends of silicone and fluorosilicone, blends of silicone and polyurethane, for example in a range of 10/90 to 20/80, of silicone to polyurethane. Heater roller 80 preferably heats the toner without degrading the toner image. In an embodiment of the invention, the heater roller is coated with a material that is more releasing than the release coating of the ITM. Alternatively or additionally, the ITM is operated for a number of cycles. Operation of an ITM generally deteriorates the release properties of the ITM, so that the roller is more releasing than the ITM.

In an exemplary embodiment of the invention, heating roller 80 is heated to a temperature between 60-200°C. In some embodiments of the invention, the selected temperature of heating roller 80 is a function of the process speed and duration of contact. At a faster process speed contact between heating roller 80 and the toner particles on ITM 20 is shorter and a higher temperature is needed.

Optionally, heating roller 80 comprises an internal heating unit 82, as known in the art.

In preferred embodiments of the invention, contact with roller 80 performs one or more and preferably all of forming the toner articles into a film, removing additional liquid from the image and increasing the transferability of the toner to the substrate.

In an exemplary embodiment of the invention, as ITM 20 rotates, the heated toner image comes into contact with output medium 60, which is guided and pressed against ITM 20 by a transfer roller 30. The toner image on ITM 20 forms a sharp printout on output medium 60 as a result of its tacky state and from the pressure exerted by transfer roller 30. In some embodiments of the invention, transfer roller 30 is additionally electro-statically charged in order to cause the toner to be pulled toward the paper during contact. Alternatively or additionally, transfer roller 30 is heated in order to assure that the toner is exposed to sufficient heat. The substrate can be pre-heated, for example as described in US Patent 6,562,539, the

CLAIMS

1. A method of heating toner of an image on a moving surface of an intermediate transfer member in order to transfer the image to a printing medium of a printing system comprising:
5 providing a toner image on an intermediate transfer member; and
placing a surface of a heated member in contact with said image on said intermediate transfer member, prior to transferring the toner image to a further surface from the intermediate transfer member,
wherein heating of the image by the contacting heated member is in addition to heating
10 by a heater, internal to said intermediate transfer member.
2. A method according to claim 1 and including;
moving the surface of the heated member together with the moving surface of the intermediate transfer member, so that the heated member surface comes into contact with the
15 intermediate transfer member surface.
3. A method according to claim 2 and including:
removing the surface of the heated member from contact with the intermediate transfer member.
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4. A method according to any of the preceding claims, wherein said heated member comprises a cylindrical drum contacting said intermediate transfer member, arranged such that portions of the intermediate transfer member surface contact portions of the heated surface and then are separated therefrom by motion of the intermediate transfer member and rotation of the
25 heated member.
5. A method according to any of claims 1-3, wherein said heated member comprises a belt contacting said intermediate transfer member, arranged such that portions of the intermediate transfer member surface contact portions of the heated surface and then are separated therefrom
30 by motion of the intermediate transfer member and motion of the heated member.
6. A method according to any of the preceding claims and including removing excess carrier liquid from the image prior to its transfer to the intermediate transfer member.

7. A method according to any of the preceding claims, wherein said heated member supplies at least 50% of the heat for heating the toner of the image on said intermediate transfer member.

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8. A method according to any of the preceding claims, wherein said heated member supplies at least 70% of the heat for heating the toner of the image on said intermediate transfer member.

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9. A method according to any of the preceding claims wherein the internal heater is a radiant heater that heats the intermediate transfer member by heat radiated and air conducted from the heater.

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10. A method according to any of the preceding claims, and including transferring the heated image from the intermediate transfer member wherein heating the toner image to a temperature suitable for transfer to a final substrate uses less than 50% of the energy necessary to heat said toner to said suitable temperature by a heater internal to the intermediate transfer member alone.

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11. A method according to any of the preceding claims wherein the image is transferred from the intermediate transfer member, under pressure.

12. A printing method comprising:

heating a toner image according to the method of any of the preceding claims; and

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transferring the still hot toner image to a final substrate.

13. A system for heating a toner image for printing on a print media comprising:

an intermediate transfer member, adapted to receive an image at a first position and to transfer the received image at a second position; and

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a heating member contacting said image and said intermediate transfer member as it passes between said first and second positions.

14. A system according to claim 13 wherein the heating member is a heated rotating drum.

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15. A system according to claim 13, wherein the heating member is a heated moving belt.

16. A system according to any of claims 13-15 and including means for removing excess
5 carrier liquid from the image prior to its transfer to the intermediate transfer member.

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